

THE RATE OF SPECIES DESCRIPTIONS IN ODONATA¹

K. J. Tennessen²

ABSTRACT: The rate of new species descriptions of Odonata over the last 150 years yields an essentially straight line, indicating that many species are yet to be discovered within the Order. More than 5,300 species are now known, and the rates of description in the suborders Anisoptera and Zygoptera have been relatively equal. However, a decline in the number of new species appearing in the three largest families over the last six decades, despite an increasing number of authors, indicates that the Odonata are now at least half known and that fewer than 10,000 species exist worldwide.

Examining the trend curve of the rate at which species have been described indicates whether nearly all species in a particular group are known or whether many remain to be discovered. For example, Steyskal (1965) found that the curve for the butterflies of North America has leveled off, indicating that alpha taxonomy for this group is essentially complete. By contrast, the curves for fleas, wasps, and mosquitoes show that many species still are undescribed. The curves for *Aedes* mosquitoes (Zavortink 1990) and the stoneflies of the world (Steyskal 1976) show no slowing in descriptive rate. In this paper, I present the status of the trend curve for the world Odonata, an Order generally purported to be well-known.

METHODS

Using Bridges' catalogue (1993), I tallied the number of valid species described in each decade, beginning with Linnaeus in 1758. Subspecies, forms and known synonyms were omitted from the counts. A decade was defined as extending from January 1 of the zero year to December 31 of the ninth year (e.g., the 1980s began on Jan. 1, 1980 and ended on Dec. 31, 1989). Exceptions were made for the first and last decades: the 1750s, from Jan. 1, 1758, to Dec. 31, 1759 (2 years); and the 1990s, from Jan. 1, 1990 to Dec. 31, 1994 (5 years). I derived the number of descriptions appearing after Bridges (1993) by searching literature and abstracts.

RESULTS

Approximately 5,300 valid species have been described from Linnaeus' time through 1994. A significant increase in the rate of Odonata descriptions did not begin until 70 years after Linnaeus (Fig. 1). Since then, the rate has been fairly

¹ Received June 11, 1996. Accepted August 1, 1996.

² 1949 Hickory Ave., Florence, AL 35630.

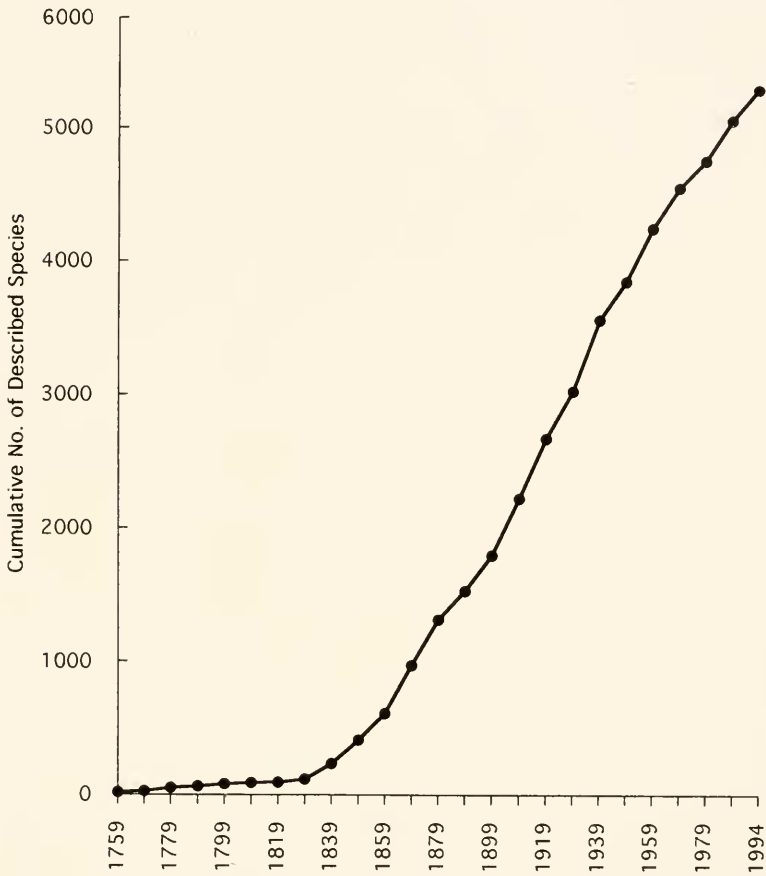


Figure 1. Trend curve of the number of world Odonata species described per decade since Linnaeus.

constant. The decade of greatest activity so far was the 1930s, when 548 species were described. A relatively low number of new species appeared in the 1970s (208), indicating that the line might begin to level off. However, in the 1980s, the rate increased again. As Steyskal (1965) pointed out, ". . . if the curve appears to be leveling off, we have no assurance that we are approaching the stage at which all species are known." The steeper inclination of the line in the first half of the 1990s, during which more than 235 species were described, indicates that we are far from nearing completion of odonate species discovery.

The number of species described to date within the two suborders, Anisoptera and Zygoptera, are remarkably similar (about 2,770 and 2,540 species, respectively). In the first half of the current decade, more Anisoptera (145) have been described than Zygoptera (90), a trend opposite that of the 1980s. In the last three decades, families in which the most species were described were Gomphidae, Coenagrionidae, Libellulidae, Corduliidae, Aeshnidae, Protoneuridae, Platycnemididae, and Megapodagrionidae, listed in descending order.

The majority of new species described recently came from tropical areas of the world (Neotropical, 92; Oriental, 74; Australasian, 40). The fauna of Europe is almost certainly known, as over 95 percent of the European fauna was described prior to 1900, and only five new species descriptions have appeared since then (see Askew 1988). Knowledge of the Nearctic fauna appears to be nearing completion (Fig. 2), although 8 species have appeared thus far in the 1990s and a few new species still await description.

The rate of new species discovery in the three largest families (each with approximately 1,000 species known) might be a clue to the status of knowledge for the Order as a whole. For example, in the Coenagrionidae and Libellulidae, the descriptive rate over the last 4 decades has slowed (Table 1). The future rate in Coenagrionidae will probably be higher than in the Libellulidae, however, as several colleagues have informed me that many undescribed species of these small, taxonomically-difficult damselflies exist in tropical areas. In contrast to these two families, the rate in the Gomphidae increased. Reasons that new species continue to appear in this family is that gomphid dragonflies are rather local in distribution, have relatively brief adult flight ranges, and are relatively secretive in their habits, factors which make them difficult to collect. In summary, the declining rate in two of the largest families, coupled with the fact that significant numbers of new species are being found in only three of the six biogeographic regions, indicates that over half the Odonata are now known.

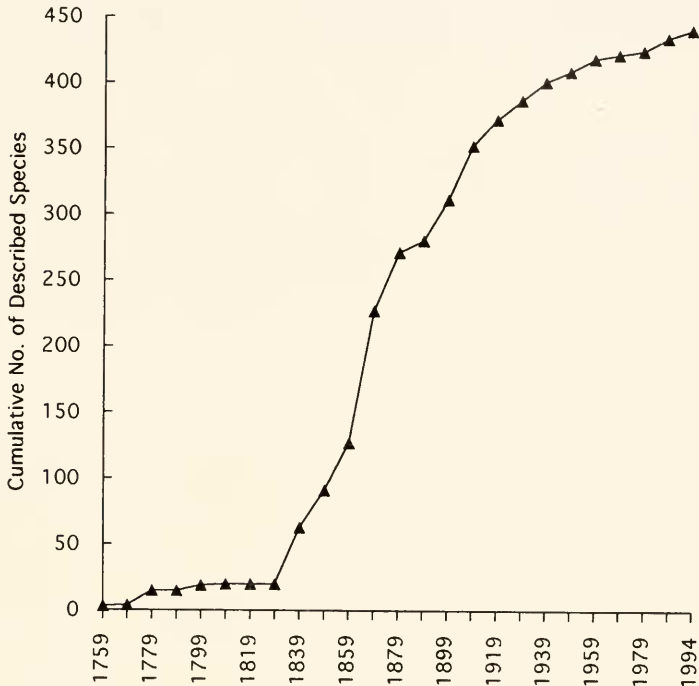


Fig. 2. Trend curve of species descriptions for North American Odonata.

Furthermore, the increasing number of authors has not increased the rate of description, although odonatologists are not evenly distributed around the world, and there are few or none in many of the tropical countries where diversity is greatest. The combined circumstances of these three factors lead me to speculate that over half the Odonata are known and thus there are fewer than 10,000 species in the world.

Higher classification within the Order is highly controversial and in need of revision. Phylogenetic studies of Odonata have lagged behind studies of other aquatic insect Orders. Progress in these two areas will continue to be slow because funding for such efforts is difficult to obtain. Most currently active Odonata taxonomists expend personal resources to support research at the species level and higher, including costs for collecting, curating, analysis, and publishing.

Table 1. Change in number of new species descriptions per decade in the three largest families of Odonata from 1900 to 1994, and the associated percent increase or decrease in the last five decades of 20th century compared with first half of century.

	Gomphidae	Libellulidae	Coenagrionidae
Mean No. New Species per Decade (1900 to 1949)	66	70	89
No. New Species/Decade			
1950-59	57	77	87
1960-69	55	50	84
1970-79	67	20	46
1980-89	83	31	37
1990-94	85	19	24
% Increase (+) or Decrease (-)			
1950-59	-14	+10	- 2
1960-69	-17	-29	- 6
1970-79	+ 2	-71	-48
1980-89	+26	-56	-58
1990-94	+29	-73	-73

ACKNOWLEDGMENTS

My thanks to Sid Dunkle and Dennis Paulson for reviewing the initial version of the manuscript, and two anonymous reviewers for additional comments.

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